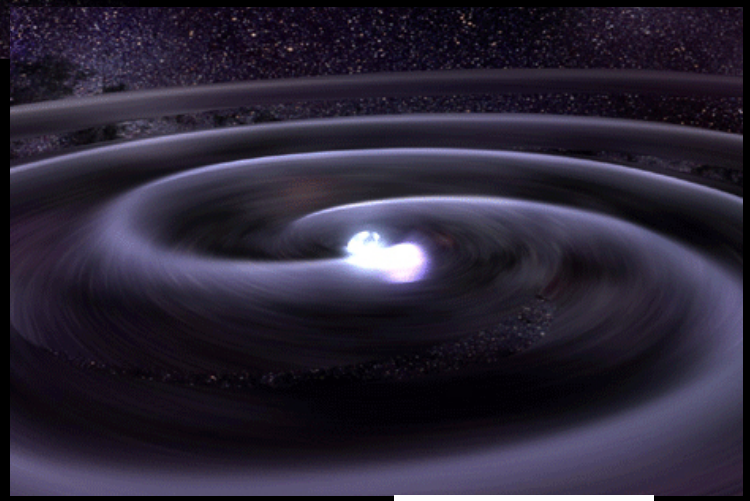
White Dwarf Binaries
from an E-M perspective



Dr. Warren R. Brown

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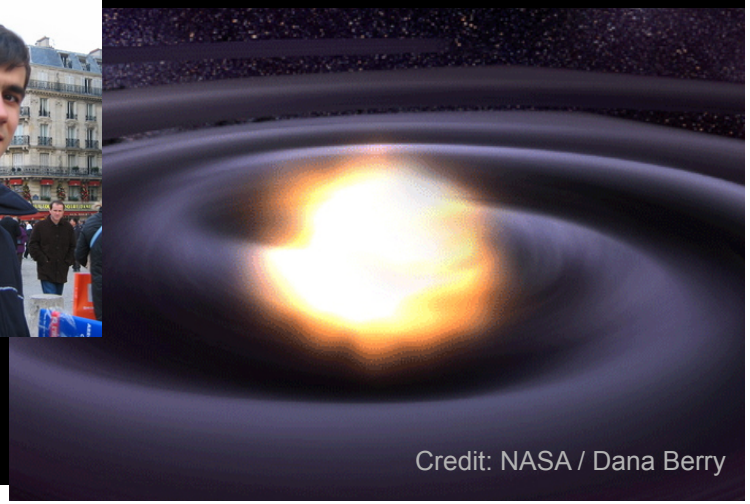
Center for Astrophysics



Collaborators: Mukremin Kilic,

Carlos Allende Prieto, Alex Gianninas, JJ Hermes

Credit: NASA / Dana Berry

Background

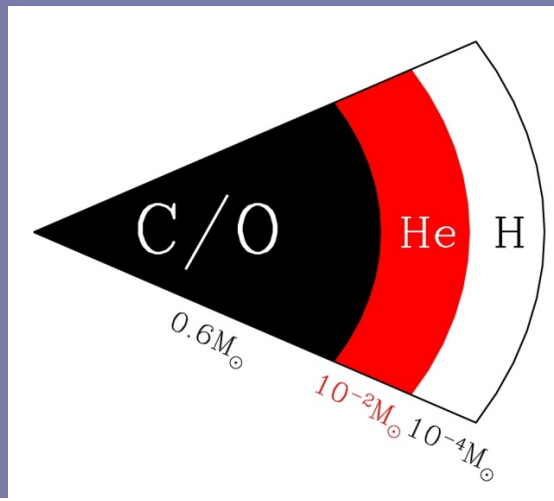
R ≈ 1 Rsun
$\tau \approx 10^{10}$ yrs

Red giant

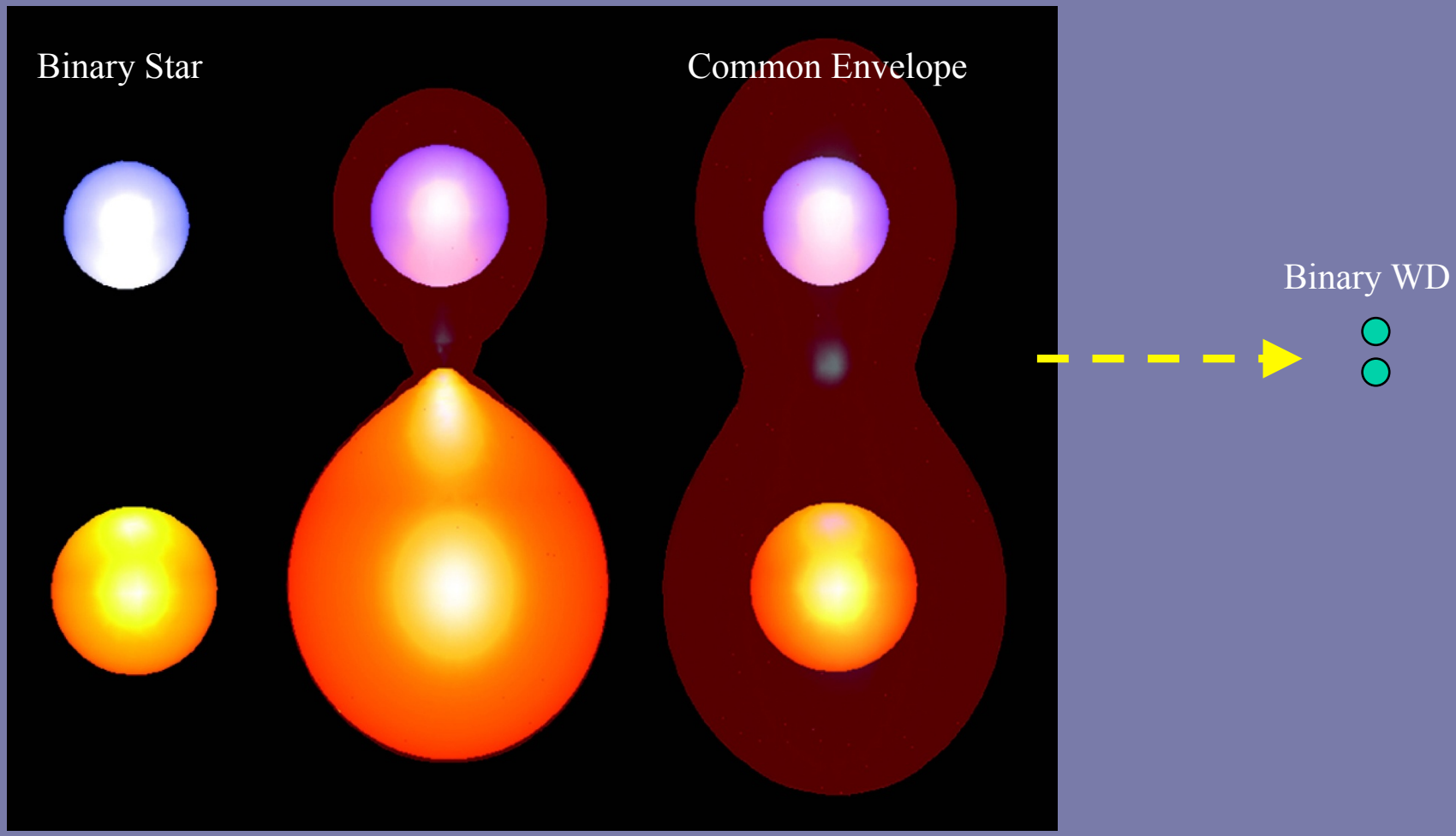
R ≈ 100 Rsun
$\tau \approx 10^{8}$ yrs

White dwarf

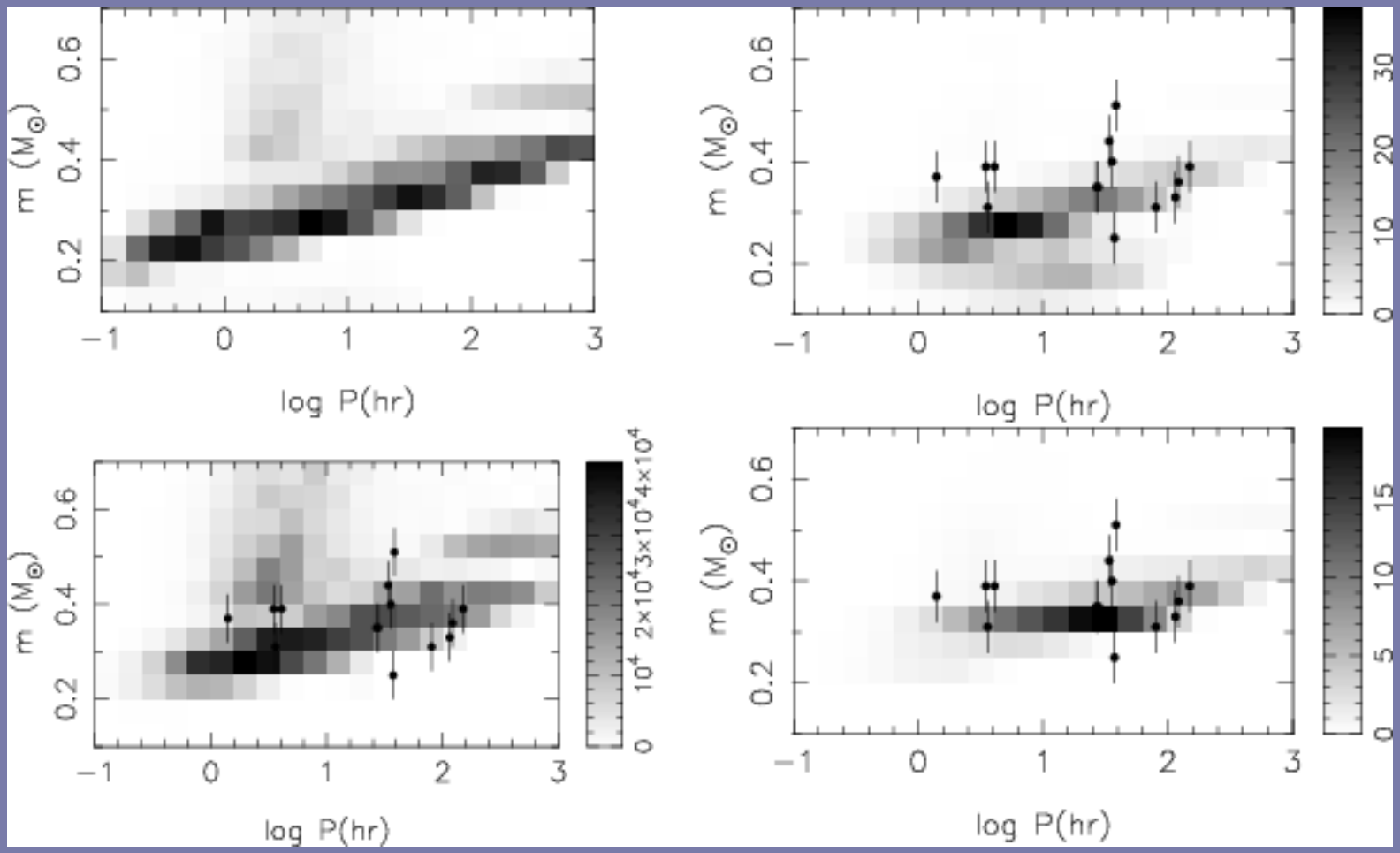
R ≈ 0.01 Rsun
$\tau \approx \infty$ yrs



Binary Stars

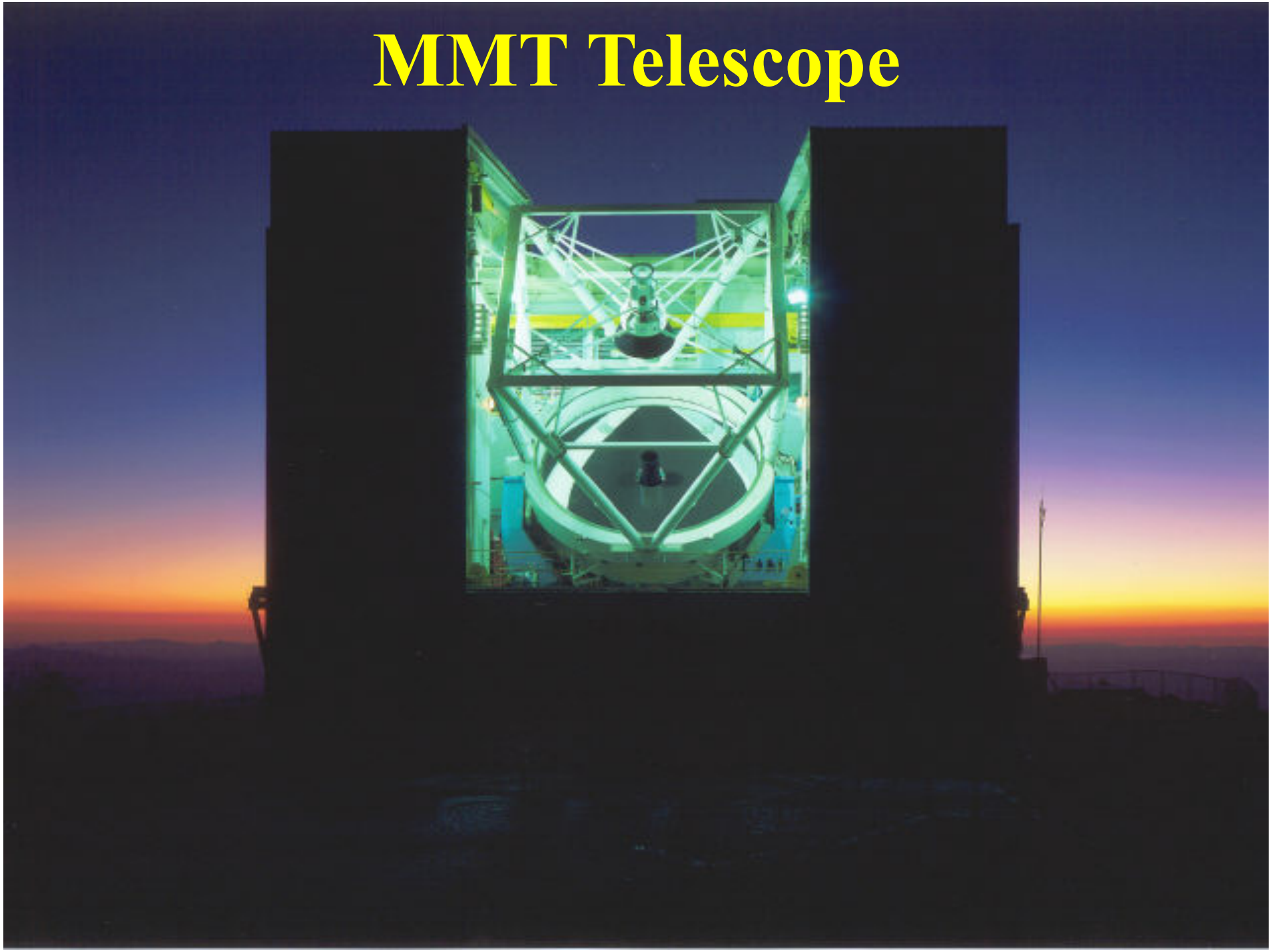


Model Predictions

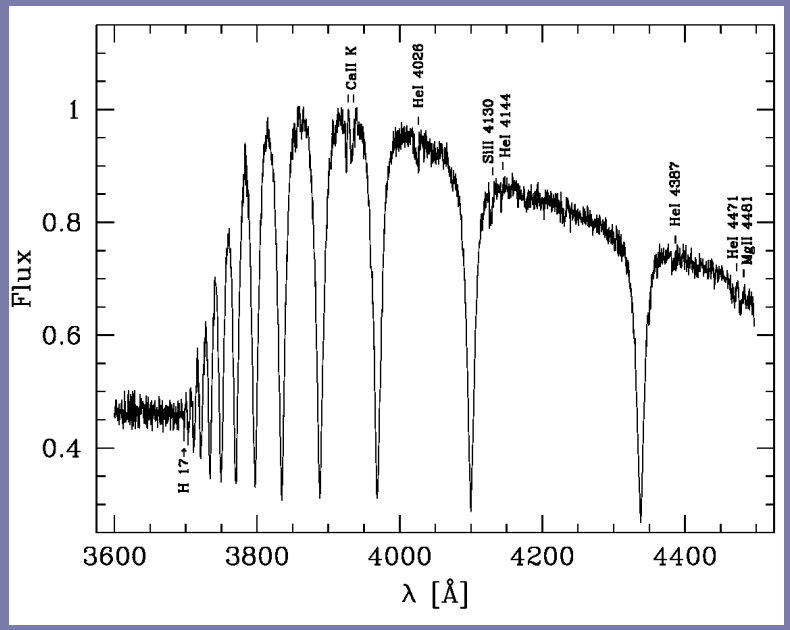


Nelemans et al 2001

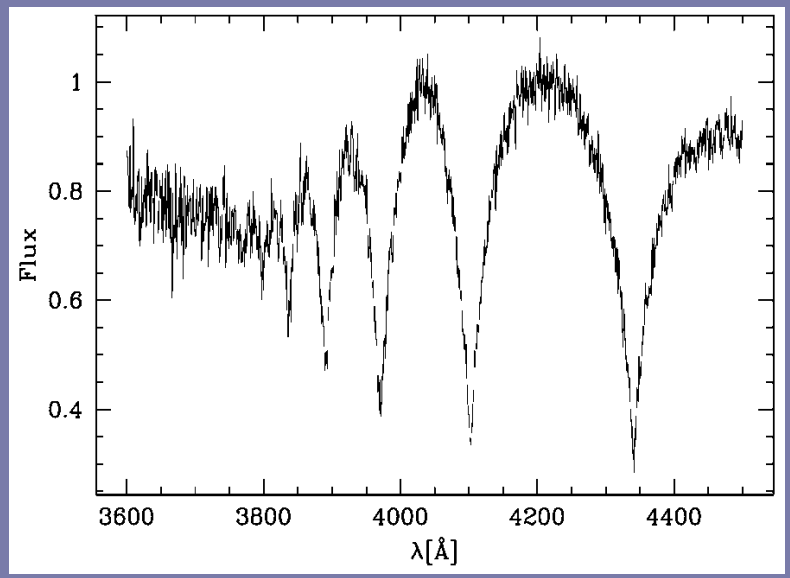
MMT Telescope



Compact Object = High Surface Gravity

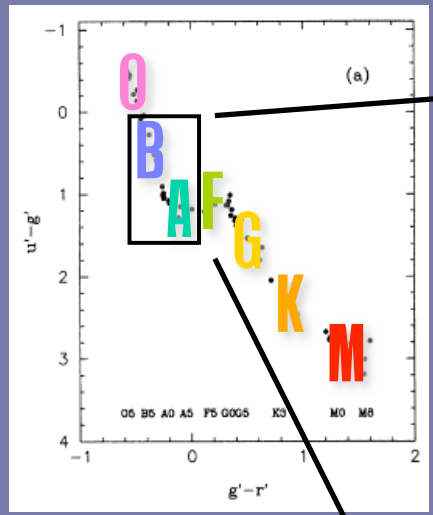


Main Sequence Star
T_{eff} = 12,000 K
log *g* = 3.9 (cgs)

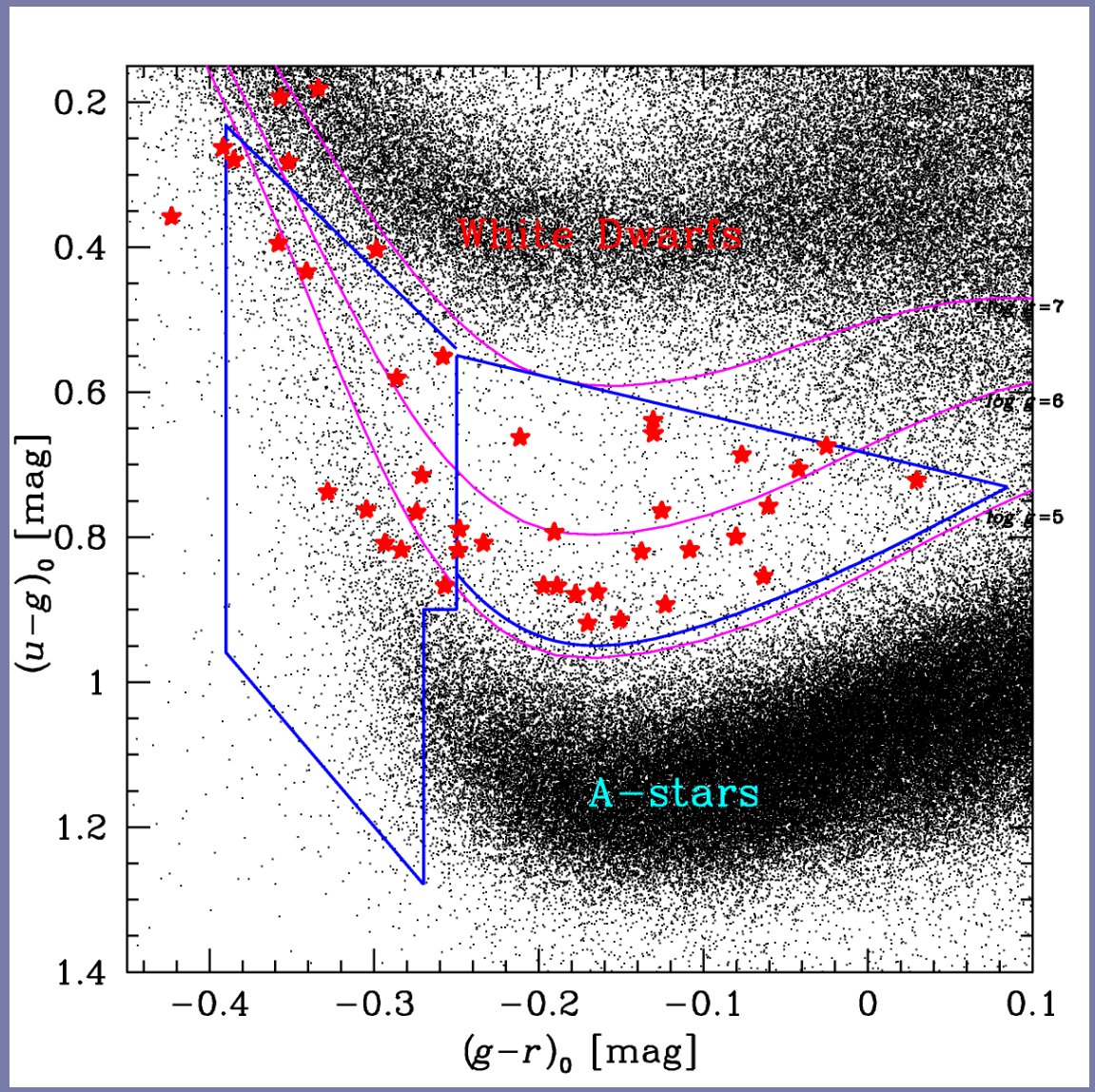


White Dwarf
T_{eff} = 12,000 K
log *g* = 7.5 (cgs)

The ELM Survey

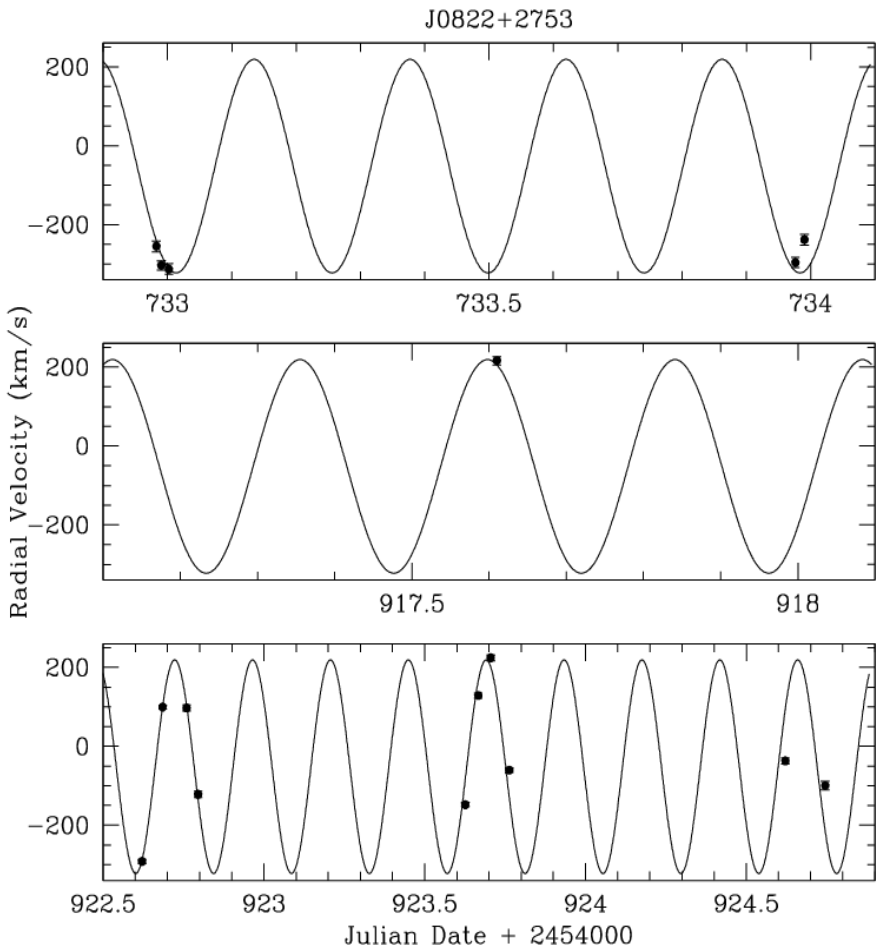


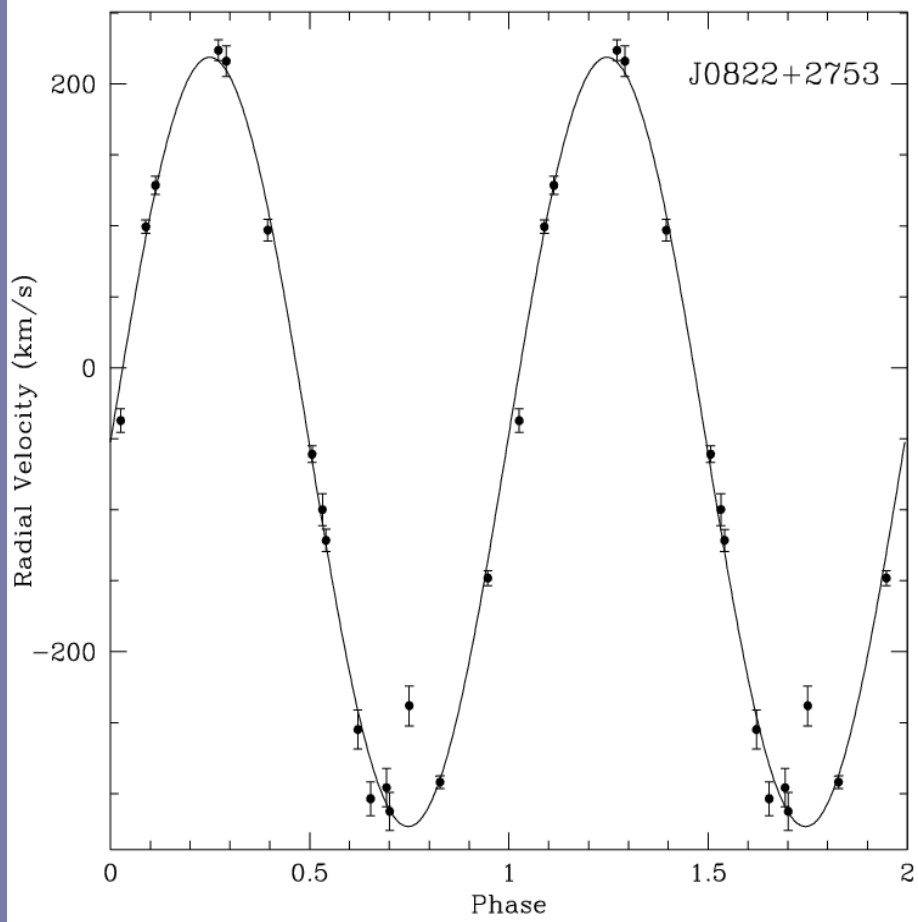
Fukugita et al (1996)



Brown et al. (2011c)

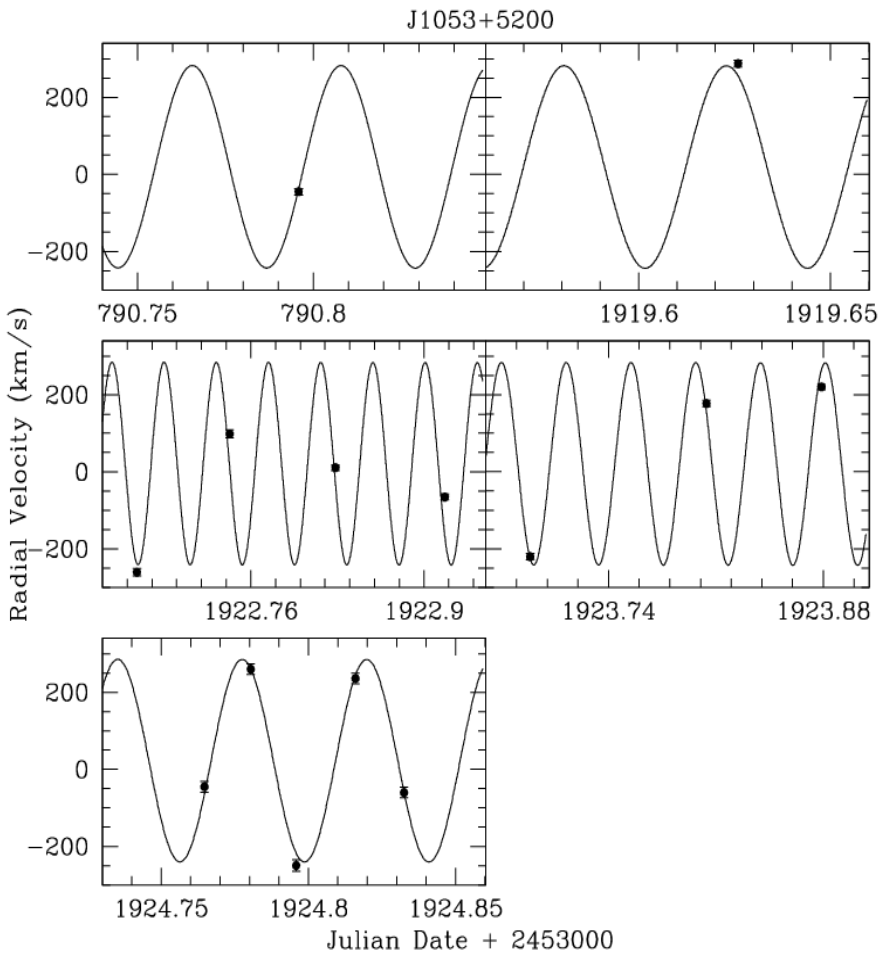
5.9 hr binary

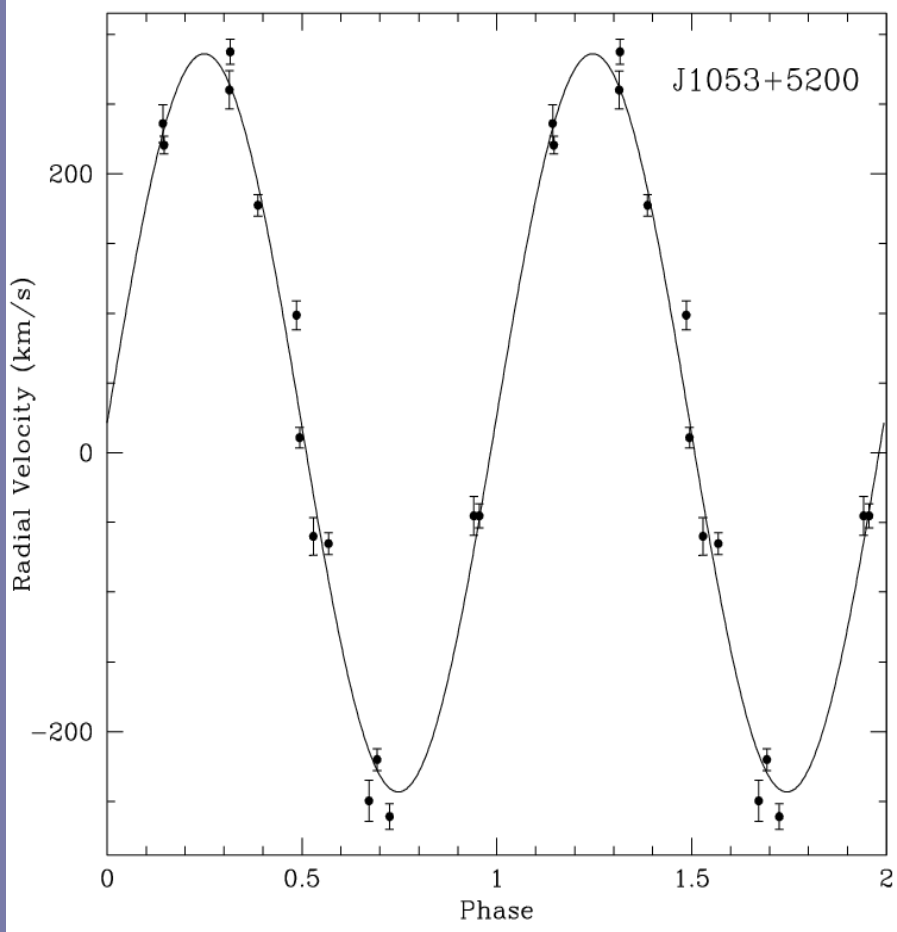




Kilic, Brown et al 2010

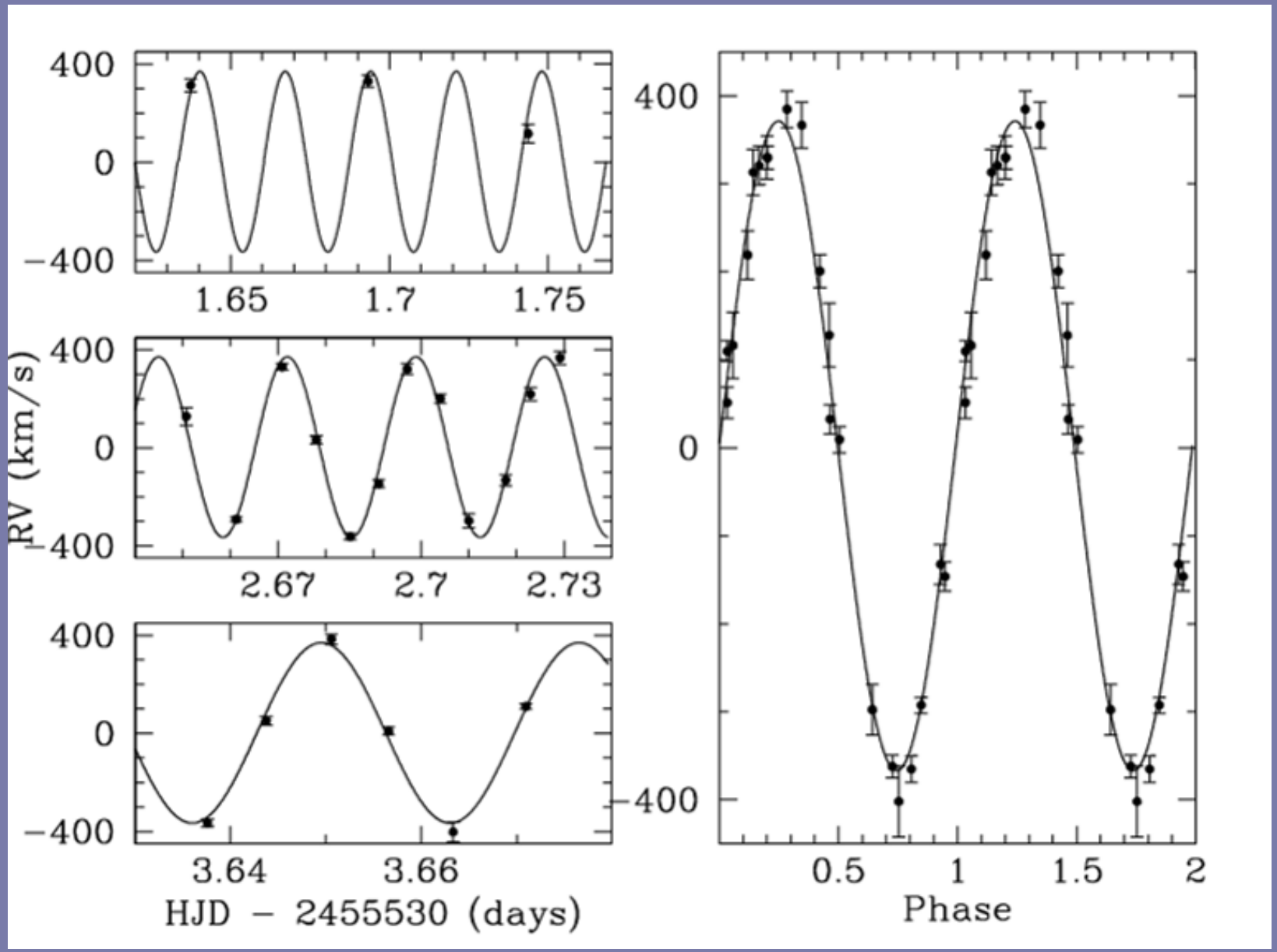
1.0 hr binary





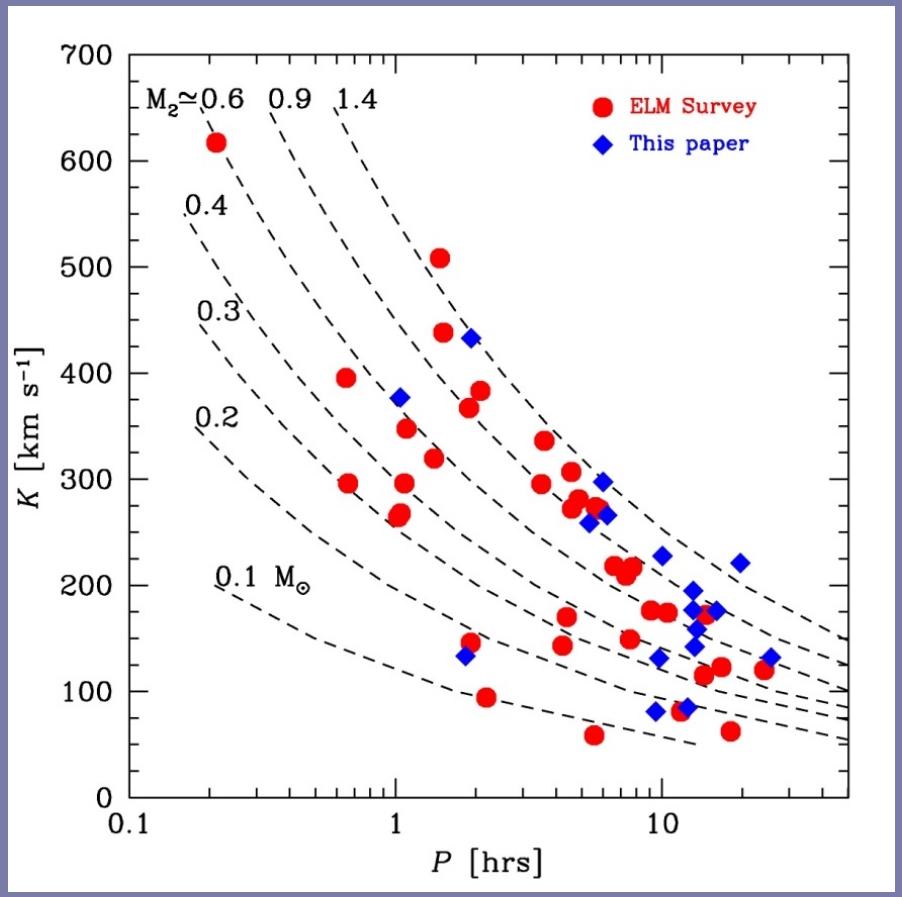
Kilic, Brown et al 2010

39 min binary

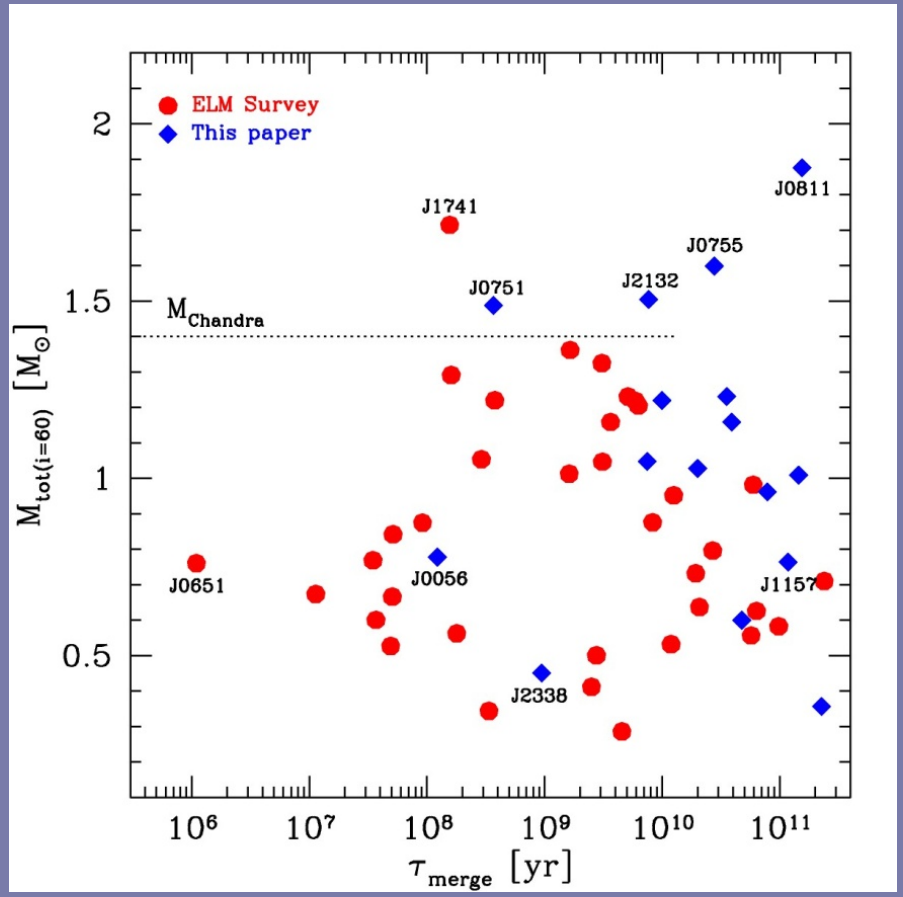


Kilic, Brown et al 2011a

Dozens of Merging WD Binaries



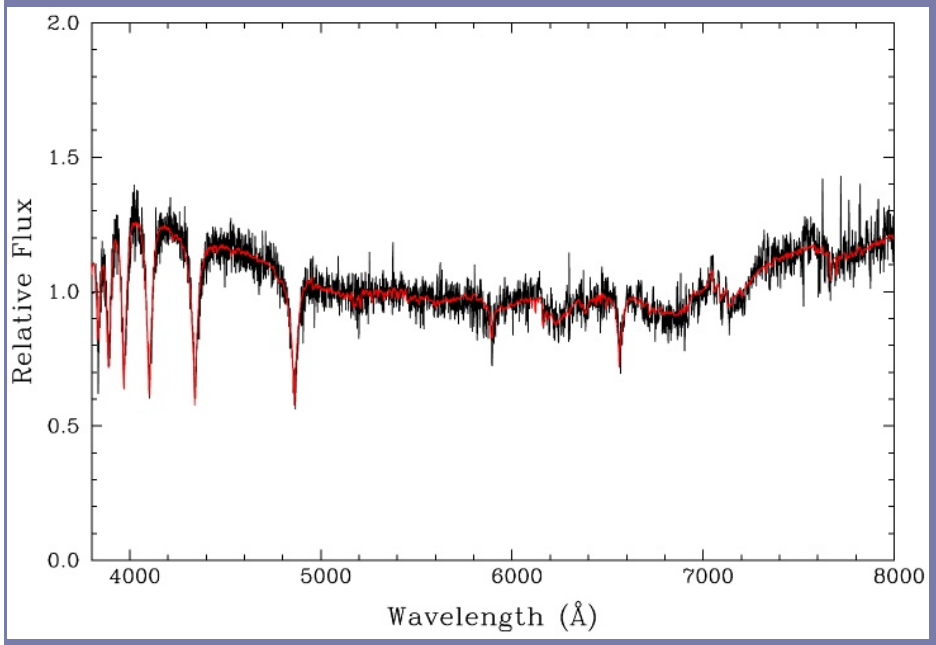
Measured



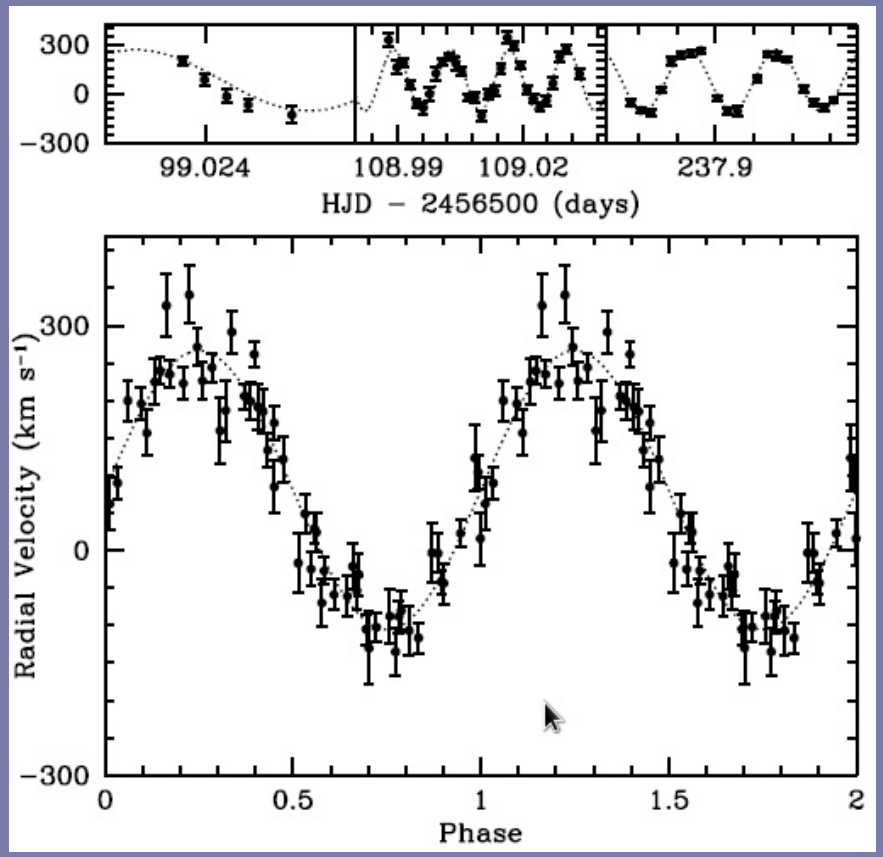
Inferred

Brown, Kilic et al 2013

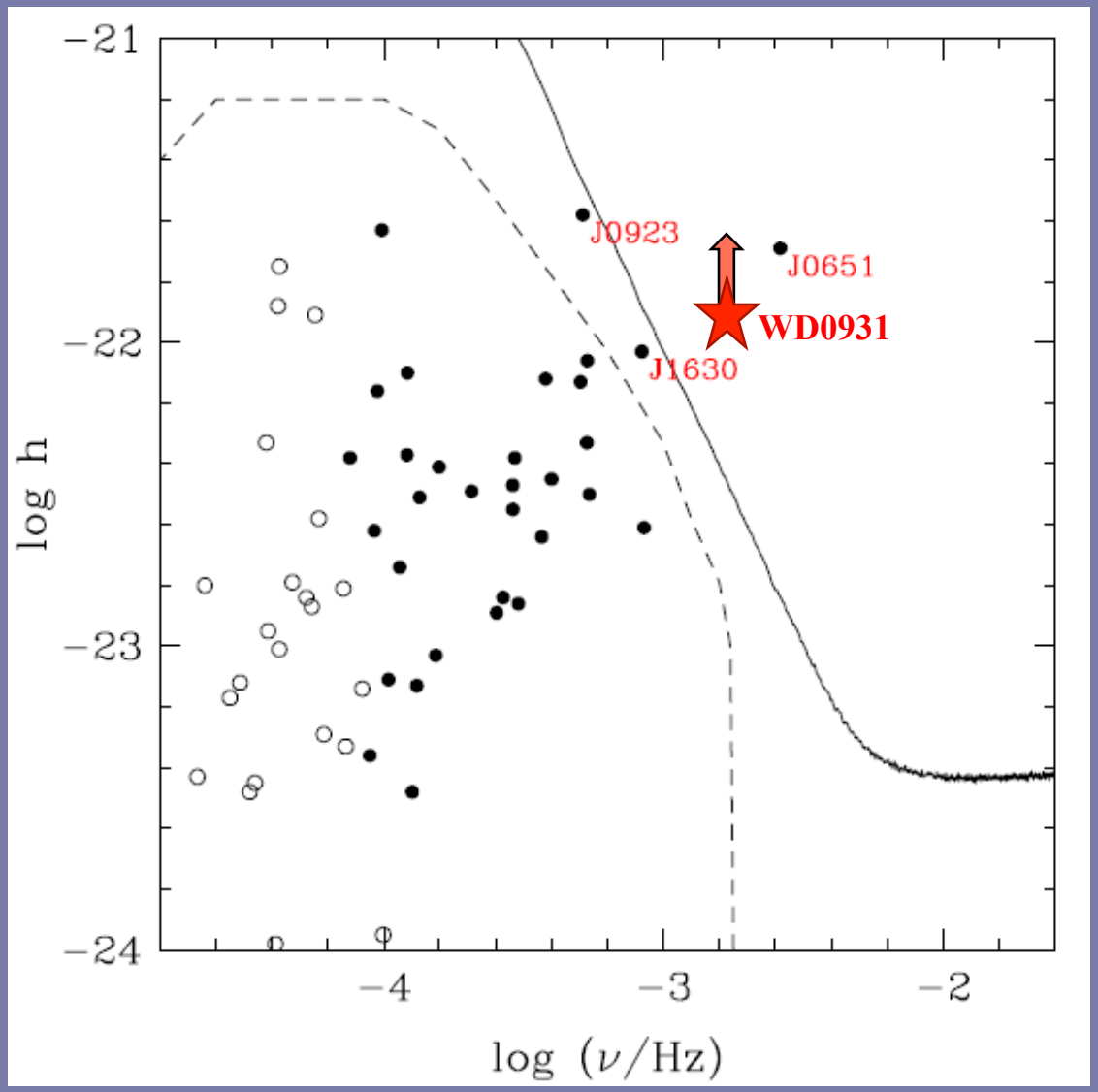
New: 20 min binary "WD 0931"



Kilic, Brown et al 2014a

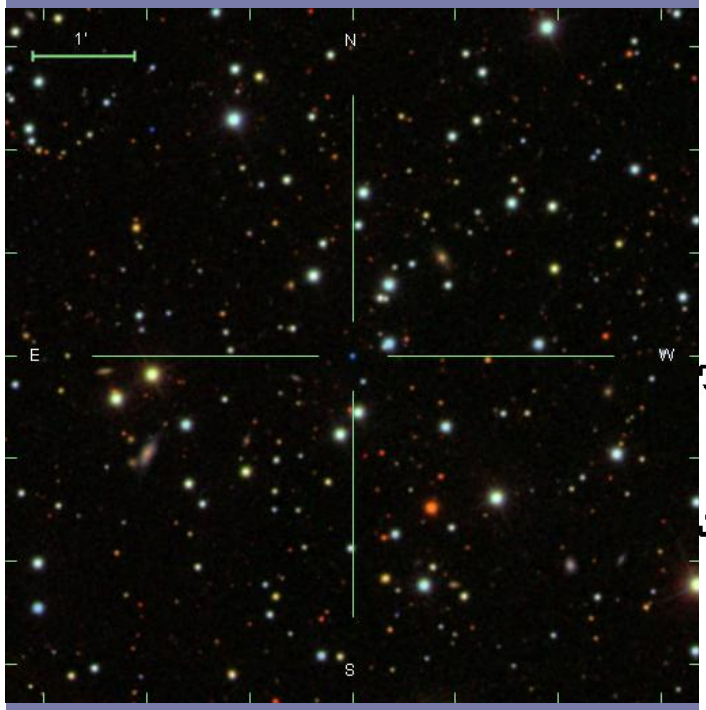


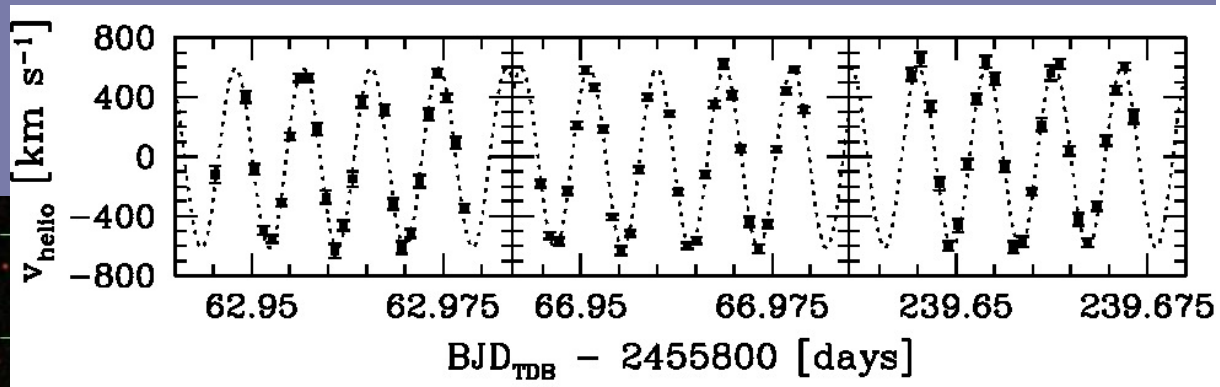
ELM WD Verification Binaries

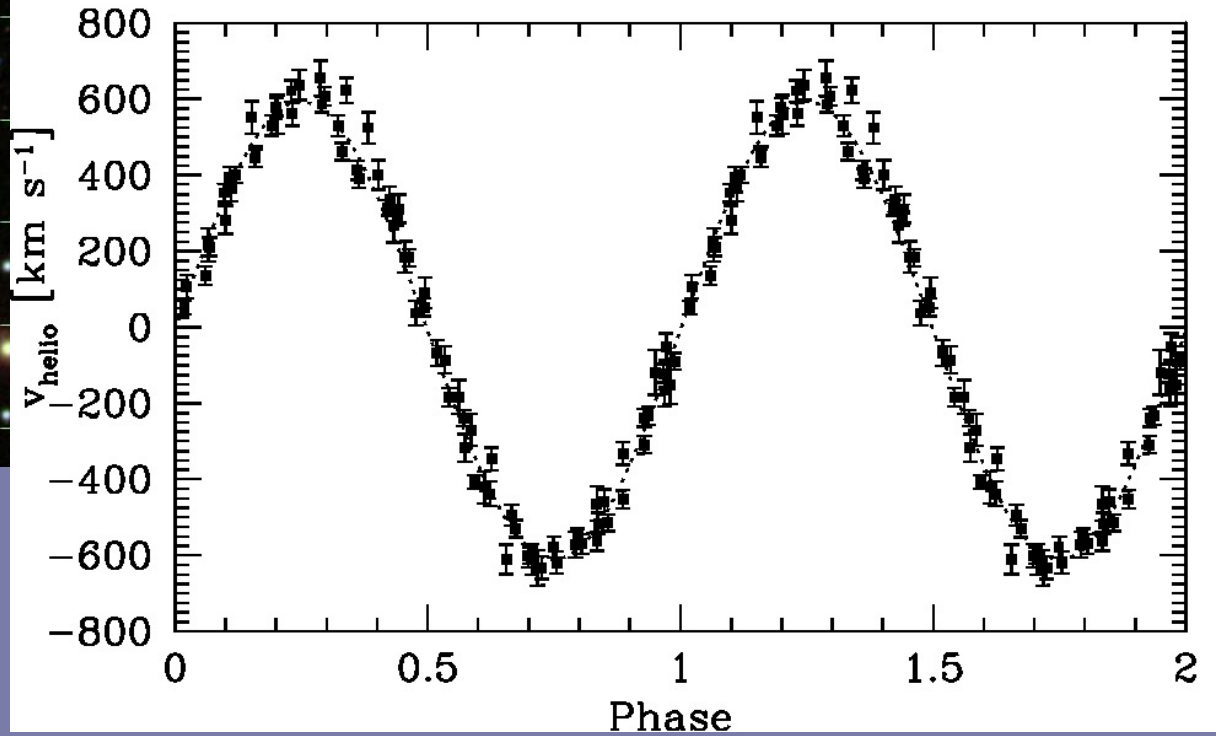


Gianninas et al 2014

12.75 min binary "J0651"

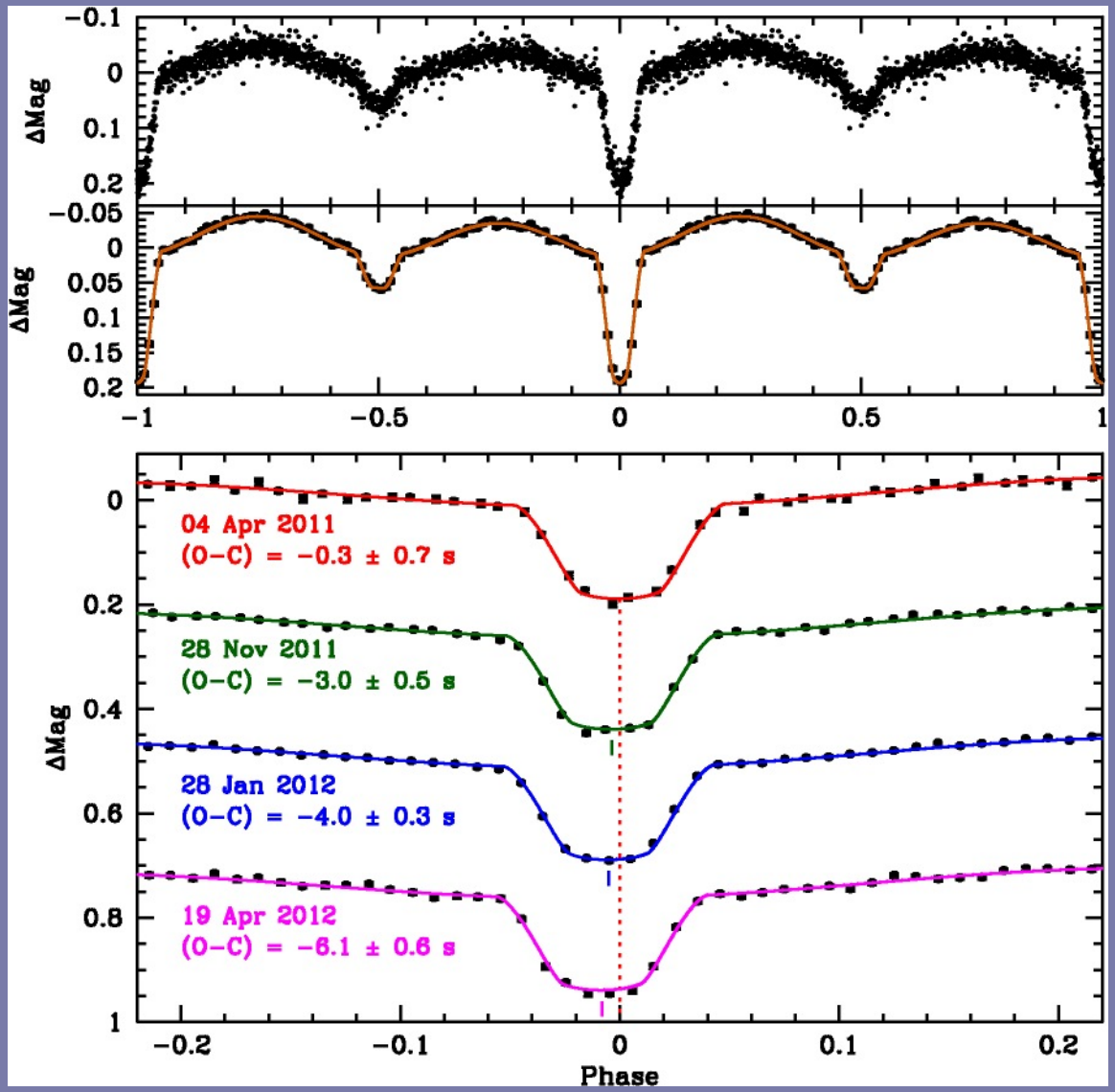


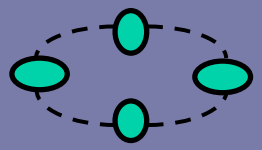




Brown, Kilic et al 2011a

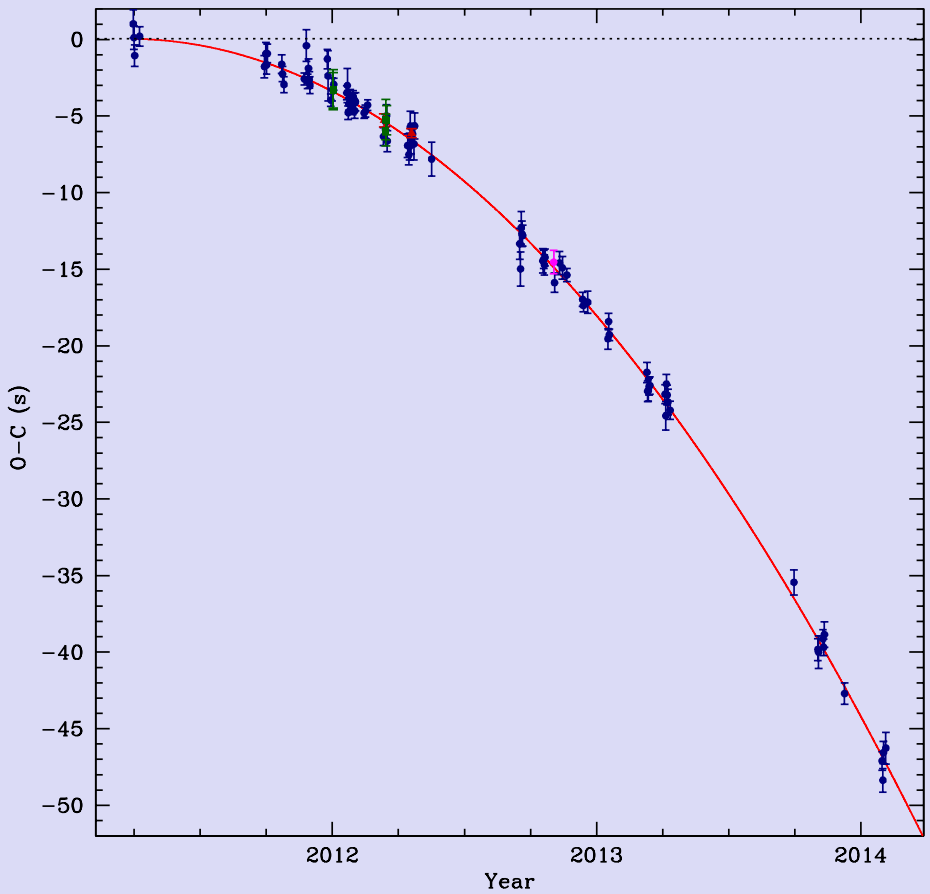
Eclipsing, tidally distorted binary



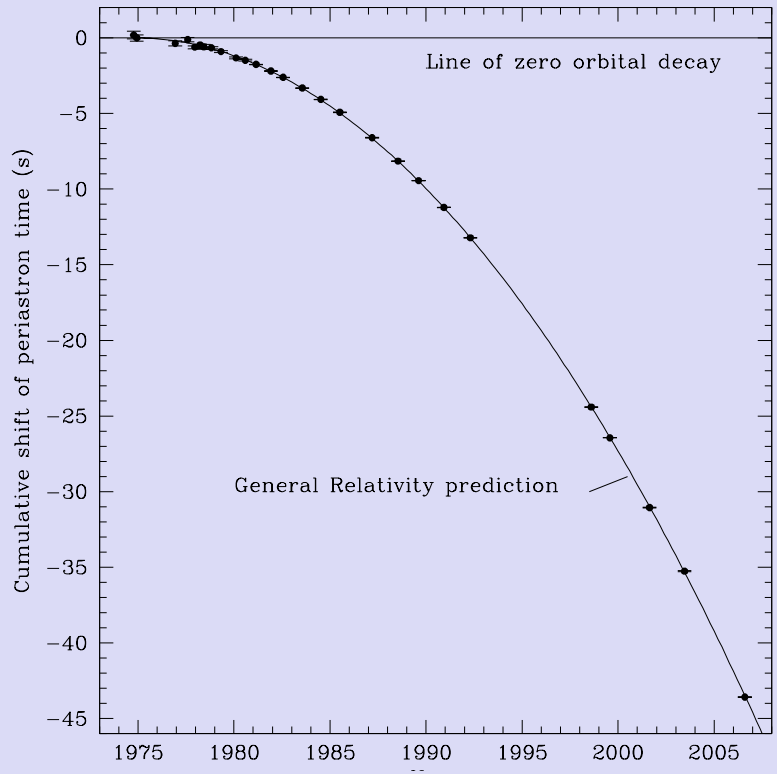


Hermes, Brown, Kilic et al 2012a

J0651 vs Hulse-Taylor pulsar

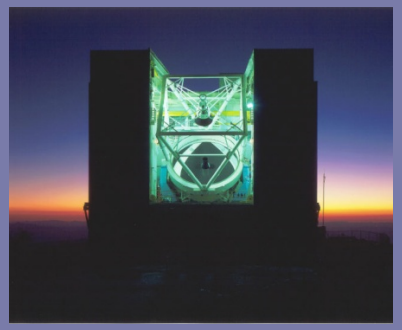


Hermes et al. 2012, ApJ, 757, L21

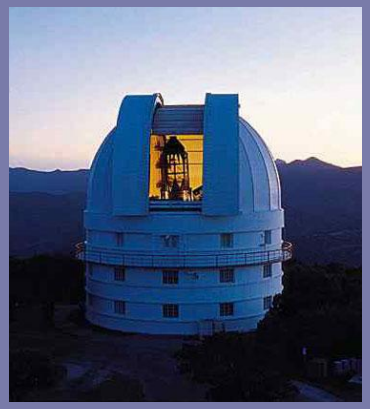


Weisberg et al. 2010, ApJ, 722, 1030

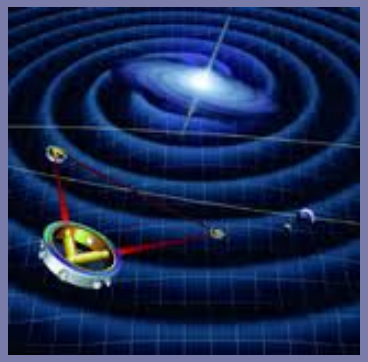
Coming Attractions



- Discovery survey.



- Identify verification binaries.



- Gravitational wave detections.